Deepwater Coral "Reefs"?

A Coral-List Server Discussion Thread

This thread is a spin off from the *Coral Reefs -- Rainforests of the Sea?* thread, which can be found here. The first message in this thread was posted to the Coral List Server by Don McAllister in response to a message from the *Coral Reefs -- Rainforests of the Sea?* thread , from which Helmut Zibrius's response set of this new discussion. All of the messages posted thus far concerning this discussion are posted below. This page will be updated as more messages are posted. Some of the writers included a previous posting in their message. For simplicity, the included messages have been replaced by a link to the previous message that was quoted. If you follow that link, moving back in your browser should bring you back to your original position. This should continue to work even if you download the document to your machine. If you have any difficulties navigating this document, send a message to the CHAMP WebMaster.

From: Don McAllister [mcall@superaje.com]
Sent: Thursday, May 25, 2000 4:02 PM
To: John Ware
Cc: coral-list@coral.aoml.noaa.gov; Callum Roberts
Subject: Re: Rain forests of the sea??

John Ware wrote:

>
> I am not sure that this is a 'controversial topic', but the
> coral list has been pretty quiet lately. Are coral reefs really
> analogous to rain forests or is the coral reef community just taking
> advantage of a catchy 'sound bite' to gain status in the eyes of the
> ecologically minded public?

I think the conservation community, including myself (!) has taken advantage of this analogy, although really coral reefs stand on their own tentacles. However, work of the IUCN SSC Coral Reef Fish Specialist Group suggests that about 25% of marine fish species are found on coral reefs. That's a pretty high level, given that coral reefs occupy less than 1% of the World Ocean, some 230,000 km2 according to a recent estimate. Hopefully Callum Roberts and Julie Hawkins will publish this year their fabulous species density maps for coral reef fishes of the world that will show the global hotspots for these fishes.

Marjorie L. Reaka-Kudla in Biodiversity II, however comes up with a better broad answer. She estimates that over 900,000 species (plants, animals, microbiota) inhabit coral reefs.

Another answer can be provided by a scuba/snorkel transect across a reef and into adjacent sandy areas. Lots of species in the first, few in the second.

But it isn't just a tropical affair (:-->), Norwegian studies show 300 species in deepwater coral 'reef' areas off their coasts. We haven't studied such areas thoroughly enough elsewhere to be sure of countes. But mapping deepwater corals off the West Coast of Canada, shows they are much more frequent there than had been hithertoo suspected and the available clues suggest a rich variety of biota. This would suggest that it is the three-dimensional structural diversity in the tropics and boreal zones which provides shelter and food, that intensifies biodiversity.

don
Don McAllister

From: Helmut ZIBROWIUS [hzibrowi@com.univ-mrs.fr]
Sent: Friday, May 26, 2000 3:43 AM
To: coral-list@coral.aoml.noaa.gov
Subject: deepwater coral "reefs"?

>But it isn't just a tropical affair (:-->), Norwegian studies show 300
>species in deepwater coral 'reef' areas off their coasts.

This is surely not specific to Norway, such deep-water coral build-ups occurs widely along the Atlantic margin of W Europe and in other parts of the world (for example at Saint-Paul and Amsterdam islands, southern Indian Ocean. Depending on where and on the depth level, the main builders are different species. Surely, these are not reefs in the common established sense, and re-introducing this term in the deep context forgets the efforts made by Teichmann and others to make understood to geologists and paleontologists that not all ancient coral mass occurrences are to be interpreted as reefs, in the sense of tropical and shallow.

One may consider that using again the term reef for these deep-water build-ups "just takes advantage of a catchy 'sound bite' to gain status in the eyes of the ecologically minded public", and connectedly, intends to drain supplementary funding (no problem, these deep communities indeed deserve detailed study).
By qualifying these structures as reefs, one also intends to benefit of "reefs are endangered". And hasn't the whole order of Scleractinia been but on a CITES-list by a bunch of brain-deficient bureaucrates?

>This would suggest that it is the
>three-dimensional structural diversity in the tropics and boreal zones
>which provides shelter and food, that intensifies biodiversity.
Surely. Similar situation with the mainly calcareous algae build-ups in

the Mediterranean, locally known as "coralligene".

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From: Don McAllister [mcall@superaje.com]
Sent: Friday, May 26, 2000 11:12 AM
To: Helmut ZIBROWIUS
Cc: coral-list@coral.aoml.noaa.gov; Risk, Michael
Subject: Re: deepwater coral "reefs"?

Helmut ZIBROWIUS wrote:
Surely, these are not reefs in the common established sense, and re-introducing this term in the deep context forgets the efforts made by Teichmann and others to make understood to geologists and paleontologists that not all ancient coral mass occurrences are to be interpreted as reefs, in the sense of tropical and shallow.

Zibrowius poses a good question. In my own papers on the topic of northern deepwater corals I have preferentially used the term "groves" to reefs.

Part of my doubt has been due to the lack of information on whether the corals occur in more or less isolated patches, or in relatively dense and large groupings. The second part of my doubt is whether the deepwater corals have been growing in situ for periods of say, centuries, and have built up a reef platform. So my own personal presumption has been that reefs constitute fairly dense and large clusters of colonies over periods measured in centuries and that the process has resulted in the build-up of a reef platform. I would be happy to be corrected on this understanding and if someone would provide me with a concise widely accepted definition of a 'coral reef.' I would hope that, although our understanding of coral assemblages has developed most strongly from tropical experience, that the terminology could be adapted or could coin new terms which would facilitate discussions of deep/cool coral assemblages. Of course where deep/cool coral assemblages do clearly differ from tropical ones is in the lack of zooxanthellae in the colonies - to my knowledge (although zooxanthellae do occur in northern sea anemonies).

The Norwegian and Irish instances show that deepwater corals do grow in masses, many colonies in close approximation and measuring hundreds of metres long. As far as the building up of a platform, it looks like some sort of a platform occurs in Norwegian coral assemblages. In the case of Labrador scleractinian

assemblages, there is a base of fallen dead colonies that goes back about 10,000 years in age, with individual colonies more than a century or two old. So the latter certainly, aside from zooxanthellae, gives the closest approximation to reef-like conditions.

Regards,
don
Don McAllister

From: Alina M. Szmant [szmanta@uncwil.edu]
Sent: Friday, May 26, 2000 4:29 PM
To: Helmut ZIBROWIUS; coral-list@coral.aoml.noaa.gov
Subject: Re: deepwater coral "reefs"?

"Reef " by definition is a structure that ships can run aground on. Coral reefs are such structures build by hermatypic corals and associated organisms. Deeper 3-D structures built by corals or other organisms (algae, worms, whatever...) are bioherms. I agree we need to stick with correct terminology, and educate the public and press in the process.

Alina Szmant

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Note: *Szmant had* Zibrowius*'s whole message in her original message.* Zibrowius*'s message is already displayed above.*

From: Don McAllister [mcall@superaje.com]
Sent: Friday, May 26, 2000 7:27 PM
To: coral-list@coral.aoml.noaa.gov
Subject: Re: deepwater coral "reefs"?

"Alina M. Szmant" wrote:

> "Reef " by definition is a structure that ships can run aground on. Coral reefs are such structures build by hermatypic corals and associated organisms. Deeper 3-D structures built by corals or other organisms

(algae, worms, whatever...) are bioherms. I agree we need to stick with correct terminology, and educate the public and press in the process.

Thanks for this enlightenment.

"A dictionary of ecology, evolution and systematics" defines bioherm as:
1) Any organism contributing to the formation of a coral reef
2) A mound-like accumulation of fossil remains on the site where the organisms lived.

The first lines of "Coral Reefs" in the Ecosystems of the World series says,
"Reefs are marine, biogenic, wave-resistant carbonate structures, also known as <hermatypic> , or reef-building organisms." [The word hermatypic is in italics].

I don't pretend to know the correct word for deepwater corals lacking zooxanthellae.

don
Don McAllister

From: McCarty and Peters [McCarty_and_Peters@compuserve.com]
Sent: Friday, May 26, 2000 9:30 PM
To: Coral Reef List Server
Cc: Don McAllister
Subject: Deep water corals

Don McAllister commented:
>>I don't pretend to know the correct word for deep water corals lacking zooxanthellae.<<

There are several terms that have been applied to this situation:

ahermatypic - meaning does not build reefs,

asymbiotic - originally coined to mean not containing zooxanthellae, and

azooxanthellate - later used when some curmudgeon reviewer complained that asymbiotic implied no symbiotic relationships at all, whereas what was really meant was no appreciable zooxanthellae concentrations.

This entire debate was fought through over the status of Astrangia danae, now Astrangia poculata, a temperate coral found in the waters of New England. A. poculata occurs side by side in forms with a brown color characteristic of its zooxanthellae and as pure white, with no zooxanthellae, and in various shades in between.

This species is NOT a deep water one, admittedly, as it can occur in as little as 10 feet of water and is found as deep as 90 feet or more. It represents a bridge between the "lifestyles" of the tropical reefs that get

all the attention and the deep water corals known only to those brave or foolish enough to go looking for them <g>.

We presented a poster on the whole "hermatypic does not equal zooxanthellate" argument in 1984 at the Atlantic Reef Committee meeting in Florida -

McCarty, H.B., M.E.Q. Pilson, J. McManus, and E.C. Peters. When is a hermatype not a hermatype? Poster presented at Atlantic Reef Committee and the International Society for Reef Studies, Advances in Reef Science Meeting, pp. 78-79 Abstracts, Rosenstiel School of Marine and Atmospheric Science, University of Miami, 26-28 October 1984.

Just my two cents worth....

Chip McCarty

From: Don McAllister [mcall@superaje.com]
Sent: Saturday, May 27, 2000 7:34 AM
To: McCarty and Peters
Cc: Coral Reef List Server
Subject: Re: Deep water corals

McCarty and Peters wrote:
> Don McAllister commented:
>>I don't pretend to know the correct word for deep water corals lacking
> zooxanthellae.<<
> There are several terms that have been applied to this situation:
> ahermatypic - meaning does not build reefs,

Thanks for the terminology, Chip. Those are helpful postings.

But the earlier parts of the thread criticized the use of the word "reef", for these boreal assemblages. Bioherm was proposed as an alternative. But the definitions of bioherm that I found were not altogether supportive of coo/deep clusters of corals.

don
Don McAllister

From: EricHugo@aol.com
Sent: Saturday, May 27, 2000 10:53 AM
To: coral-list@coral.aoml.noaa.gov
Subject: Re: deepwater coral "reefs"?

Hi Alina and coral-list:

Is there a point when a correct usage of "bioherm" over "reef" for such structures became semantically favored? I ask because I find the following perhaps relevant:

Coates, Anthony G. and Jeremy B.C. Jackson. 1987. Clonal growth, algal symbiosis, and reef formation by corals. Paleobiology 13(4) 363-378.

(I will not quote directly to avoid copyright concerns, although I also hope that the authors will point out if my translation is incorrect or improper, although I maintain the textual use of the word "reef" and "bioherm").

"Rugosan corals that formed reefs likely lacked zooxanthellae because of morphological evidence. Most zooxanthellate corals today and in the fossil record contribute to reef formation, but many others are ahermatypic. Recent reef formation has little to do with being zooxanthellate but depends on environmental factors. Using morphology to indicate the presence of zooxanthellae, there exist recent deepwater analogues to the shallow water azooxanthellate Devonian Edgecliff Bioherm. "

Here we have a concatination of terms, distribution, history, and ecology that makes this thread all the more intriguing.

Thanks for the clarification

Eric Borneman

From: Alina M. Szmant [szmanta@uncwil.edu]
Sent: Wednesday, May 31, 2000 5:03 PM
To: EricHugo@aol.com; coral-list@coral.aoml.noaa.gov
Subject: Re: deepwater coral "reefs"?

Eric:

The definition of a bioherm is a herm (mound) made by living organisms. It can be located in shallow, deep, or intermediate depths. Again, a "reef" is "a chain of rocks or ridge of sand at or near the surface of water" or "a hazardous obstruction" (Webster's New Collegiate Dictionary). Neither has anything to do with corals or zooxanthellae specifically.

Coral reefs are bioherms or reefs made by corals and associated organisms. For the most part, hermatypic corals have zooxanthellae, but many zooxanthellate corals either do not live on or form reefs, or live on reefs but are not really a major contributor to reef formation (e.g. Favia fragum...).

The confusion in terminology is due (1) to the misconception that hermatypic means zooxanthellae-containing, and (2) that everyplace there is coral there is a coral reef. Corals can have high cover on a volcanic substrate but that doesn't make it a coral reef in my opinion unless there has been

carbonate accretion over the volcanic substrate. Further, in places like Florida, there is some coral cover over exposed Pleistocene reef substrate, which locally are considered coral reefs (as opposed to a coral community growing over a fossil reef). Everyone wants to have a coral reef in their back yard and many systems that are not true "coral reefs" are being called by that name.

With regard to "deepwater" coral reefs, the only ones that would fit a strict definition would be ones that were drowned (e.g. Conrad Neumann's give-up reefs). Catch-up reefs would also fit since they are usually grow into shallow water. As ships get bigger and have deeper hulls, I guess the "dangerous obstruction" part of the reef definition would include deeper water coral reefs that big ships could run into. If we include submarines, then all depths are fair game....

Anyway, that is how I analyze the terminology based on first principles and dictionaries.

Alina Szmant

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Note: *Szmant had Borneman's whole message in her original message. Borneman's message is already displayed above.*

From: Pam Muller [pmuller@seas.marine.usf.edu]
Sent: Thursday, June 01, 2000 10:29 AM
To: Alina M. Szmant
Cc: EricHugo@aol.com; coral-list@coral.aoml.noaa.gov
Subject: Re: deepwater coral "reefs"?

I concur wholeheartedly with Alina and would add a couple of small details.

A coral is either zooxanthellate or azooxanthellate in most cases (one can find exceptions to any "rule"). However, a coral is not inherently "hermatypic" or "ahermatypic". Rather, whether coral can accrete limestone faster than it is eroded away or buried by a variety of processes is a function of the environment, in addition to the organism's accretion potential. For example, Montastrea spp. are hermatypic in the Caribbean, but not on the West Florida Shelf. There are also many local environments

in the Caribbean where Montastrea can live but not construct bioherms.

This distinction is critical to conservation efforts, because a management decision to maintain environmental conditions that can support survival of Montastrea, for example, could be quite different than a management decision to maintain environmental conditions that can support reef (meaning "bioherm") development.

Pamela Hallock Muller, Professor
Department of Marine Science
University of South Florida

Note: *Muller had Szmant's whole message in her original message. Szmant's message is already displayed above.*

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lasted updated 06/01/00
by Monika Gurnée
CHAMP Webmaster